JEE-Main-27-07-2022-Shift-1 (Memory Based)

Chemistry

Question: Match the following.

(Column I) Ions	**(Column II)** Disease
(A) Fluoride	**(i)** Damage kidney
(B) Lead	**(ii)** Brown mottling of teeth
(C) Sulphate	**(iii)** Blue Baby syndrome
(D) Nitrate	**(iv)** Laxative effect

Options:

(a) A → (i); B → (iii); C → (ii); D → (iv)

(b) A → (iv); B → (iii); C → (i); D → (ii)

(c) A → (iii); B → (ii); C → (iv); D → (i)

(d) A → (ii); B → (i); C → (iv); D → (iii)

Answer: (d)

Solution:

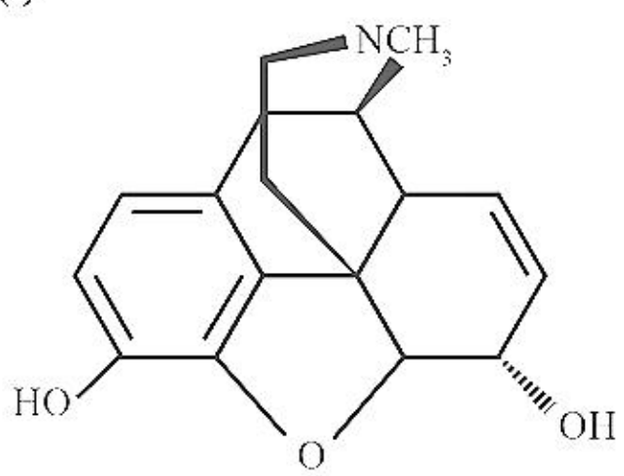
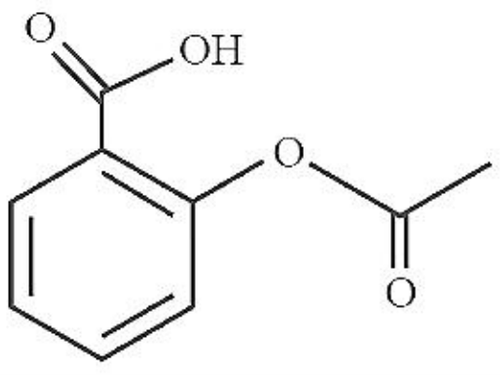
Fluoride ⇒ Brown mottling of teeth

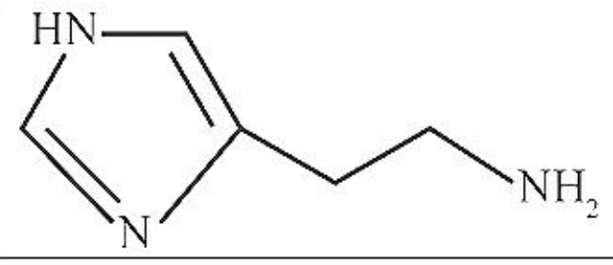
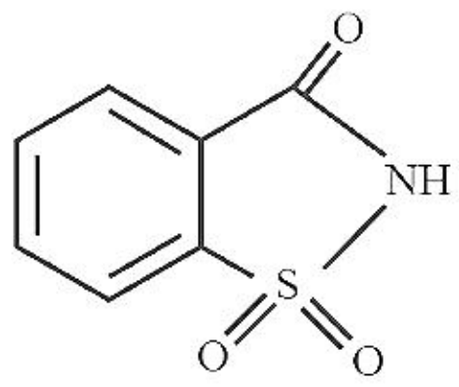
Lead ⇒ Damage kidney

Sulphate ⇒ Laxative effect

Nitrate ⇒ Blue Baby syndrome

Question: Match the following.

(Column I)	**(Column II)** Structures
(A) Antacids	**(i)** 
(B) Analgesic	**(ii)** 
(C) 500 times greater than sugar	**(iii)**

	
(D) Narcotics	**(iv)** 

Options:

(a) A → (i); B → (iii); C → (ii); D → (iv)

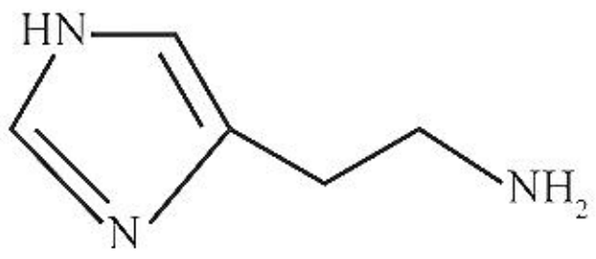
(b) A → (iv); B → (iii); C → (i); D → (ii)

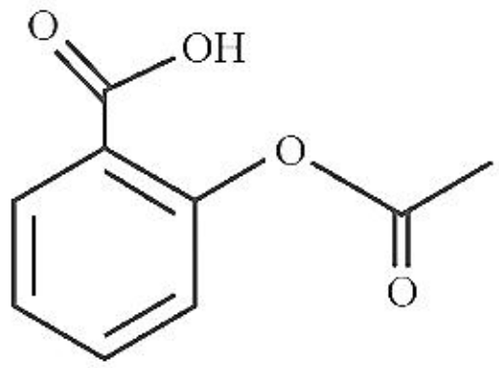
(c) A → (iii); B → (ii); C → (iv); D → (i)

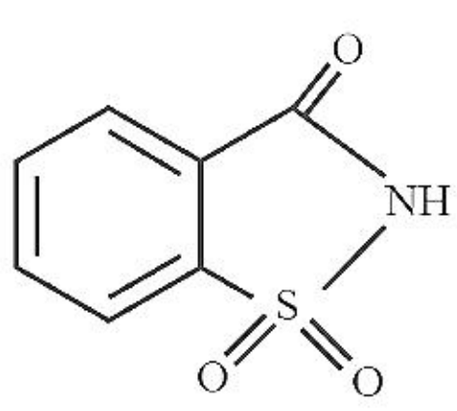
(d) A → (ii); B → (i); C → (iv); D → (iii)

Answer: (c)

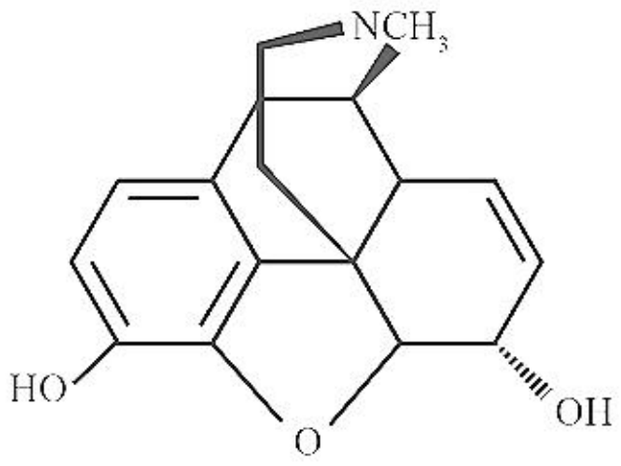
Solution:

(A) Antacids ⇒ 

(B) Analgesic ⇒ 

(C) 500 times greater than sugar ⇒ 

(D) Narcotics ⇒



Question: Statement -1: H_2O_2 can act as oxidizing agent in both acidic and basic medium
Statement-2: Density of H_2O at 298 K is less than D_2O
Options:
(a) Both statement 1 and 2 are correct
(b) Statement 1 is correct but statement 2 is incorrect
(c) Statement 1 is incorrect but statement 2 is correct
(d) Both statement 1 and 2 are incorrect.
Answer: (a)
Solution: H_2O_2 can act as oxidizing agent in both acidic and basic medium.
Density of H_2O at 298 K is less than that of D_2O
Therefore, both the statements are true.

Question: Sugar X is reacted with furfural and further reacted with Resorcinol to give a colored compound. Sugar X is
Options:
(a) Aldopentose
(b) Aldotetrose
(c) Carboxylic acid
(d) Ketotetrose
Answer: (d)
Solution: Seliwanoff's reagent is a mixture of resorcinol and concentrated hydrochloric acid. Ketose sugars react with the Seliwanoff's reagent to give immediately a deep cherry red color.

Question: In D-glucose find molality of Glucose if mass % is 10.8% and weight of solution is 250g.
Options:
(a) 0.6 m
(b) 0.06 m
(c) 6 m
(d) 2.5 m
Answer: (a)
Solution: Weight of solution = 250 g
Mass % = 10.8%

$$\frac{\text{Mass of glucose}}{\text{Mass of solution}} \times 100 = 10.8$$

$$\text{Mass of glucose} = \frac{10.8}{100} \times 250 = 27 \text{ g}$$

$$\text{Molality} = \frac{\text{Mass of glucose}}{\text{Molar mass of glucose}} \times \frac{1000}{\text{wt.of solution}}$$

$$= \frac{27}{180} \times \frac{1000}{250} = 0.6 \text{ m}$$

Question: Boiling point of non volatile solution A and B are same. Mass percent of sol A is 2% and mass percent of sol B is 3%. What is the ratio of their Mol. mass?

Options:

(a) $M_A = 4M_B$

(b) $M_B = 4M_A$

(c) $3M_A = 2M_B$

(d) $3M_B = 2M_A$

Answer: (c)

Solution:

$(\Delta T_b)_A = (\Delta T_b)_B$

$K_b\, m_A = K_b\, m_B$

$$\frac{2}{M_A \times 98} = \frac{3}{M_B \times 97}$$

$$2M_B = 3M_A$$

Question: Statement-1: Cl^- of $Al(Al_2Cl_6)$ and $Be(BeCl_2)$ form bridged structure and acts as Lewis base

Statement-2: Hydrolysis of aluminium and beryllium reacts with excess of alkalis to give beryllate and aluminate ion

Options:

(a) Both statement 1 and 2 are correct

(b) Statement 1 is correct but statement 2 is incorrect

(c) Statement 1 is incorrect but statement 2 is correct

(d) Both statement 1 and 2 are incorrect

Answer: (c)

Solution: Beryllium hydroxide dissolves in excess of alkali to give a beryllate ion, $[Be(OH)_4]^{2-}$ just as aluminium hydroxide gives aluminate ion, $[Al(OH)_4]^-$.

The chlorides of both beryllium and aluminium have Cl^- bridged chloride structure in vapour phase. Both the chlorides are soluble in organic solvents and are strong Lewis acids. They are used as Friedel Craft catalysts.

Question: The name of oxyacid of phosphorus having max no. of oxygen

Options:

(a) Hypophosphorous acid

(b) Pyrophosphoric acid

(c) Phosphorus acid

(d) Phosphoric acid

Answer: (b)

Solution:
Hypophosphorous acid ⇒ H_3PO_2
Pyrophosphoric acid ⇒ $H_4P_2O_7$
Phosphorus acid ⇒ H_3PO_3
Phosphoric acid ⇒ H_3PO_4

Question: What are the monomer of Glyptal, Buna-S?
Options:
(a) Glyptal – Phenol, Formaldehyde; Buna-S – Styrene
(b) Glyptal – Ethylene, Glycol, Phthalic acid; Buna-S – 1,3-Butadiene, Styrene
(c) Glyptal – Phenol, Phthalic acid; Buna-S – 1,3 Butadiene, Acrylonitrile
(d) Glyptal – Urea, Formaldehyde; Buna-S – 1,3 Butadiene, Propene
Answer: (b)
Solution: Monomers of Glyptal are Ethylene Glycol, Phthalic acid
Monomers of Buna-S are 1,3-Butadiene, Styrene

Question: Find out the solubility product of CaF_2 if solubility of CaF_2 is 2.34 g/100 mL
Options:
(a) 0.108 $(mol/L)^3$
(b) 0.072 $(mol/L)^3$
(c) 0.036 $(mol/L)^3$
(d) 0.032 $(mol/L)^3$
Answer: (a)
Solution: Solubility $= \frac{2.34}{100}$ g/ml
Molar mass of $CaF_2 = 40 + 19 + 19 = 78$ g/ml
Solubility in (mol/L) $= \frac{2.34}{78} \times \frac{1000}{100}$ mol / L $= 0.3$mol / L

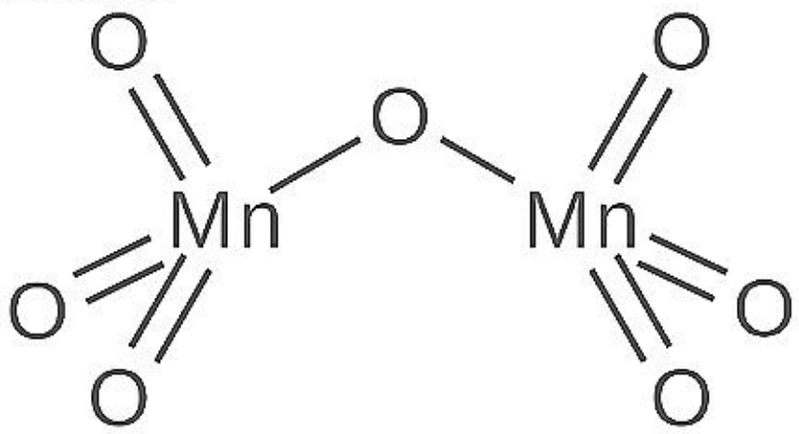
$$CaF_2 \rightleftharpoons Ca^{2+} + 2F^-$$
$$s \quad 2s$$
$K_{sp} = s \times (2s)^2 = 4s^3$
$K_{sp} = 4 \times (0.3)^3 = 0.108\ (mol/L)^3$

Question: Change in oxidation state of C when oxalic acid reacts with acidic $KMnO_4$
Options:
(a) 5
(b) 2
(c) 1
(d) 3
Answer: (c)
Solution: $2MnO_4^- + 16H^+ + 5\overset{-3}{C_2}O_4^{2-} \rightarrow 2Mn^{2+} + 10\overset{+4}{CO_2} + 8H_2O$

Question: Assertion: Hydrogen's 2s orbital has more energy than lithium's 2s orbital
Reason: For same orbital, as atomic number increases energy decreases
Options:

(a) Both assertion and reason are true, reason is correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not a correct explanation of the assertion.
(c) Assertion is true, but reason is false
(d) Assertion is false, but reason is true
Answer: (a)
Solution: An increase of atomic number is in the order, H < Li
Energies of the orbitals in the same subshell decrease with an increase in the atomic number.
Hence, 2s orbital (energy level) of Li will be less than H

Question: The number of Mn = O bond in Mn_2O_7
Options:
(a) 7
(b) 4
(c) 5
(d) 6
Answer: (d)
Solution:



Question: After 30 sec, product was 1/16 of reactant. Calculate half life?
Answer: 330.00
Solution:

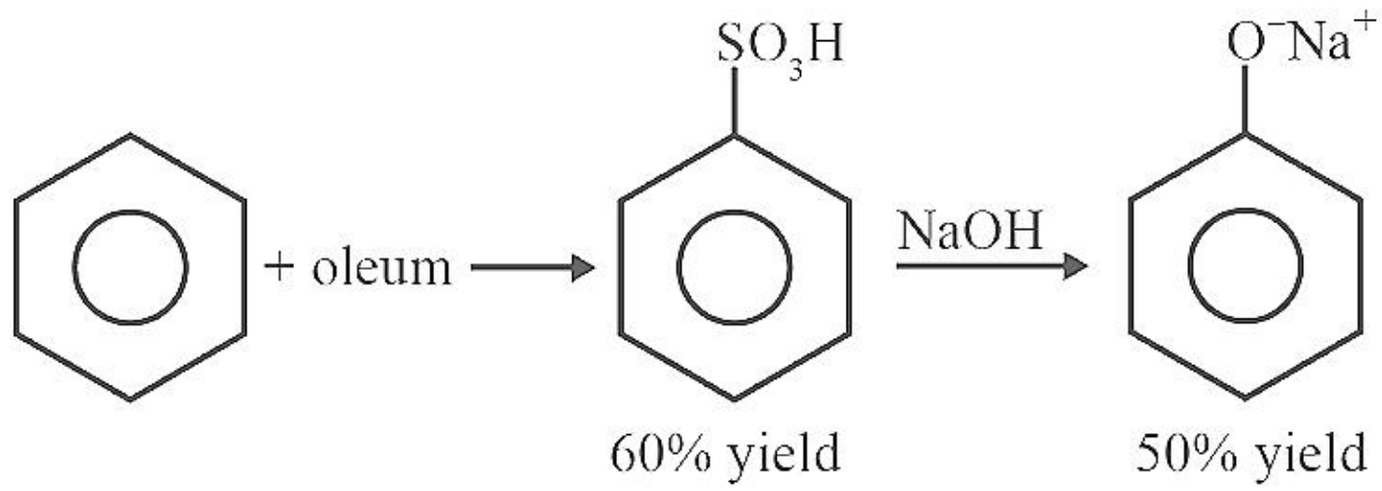
$$k = \frac{2.303}{t}\log\frac{[R]_o}{[R]}$$

$$k = \frac{2.303}{30}\log\frac{16}{15}$$

$$k = 0.0021$$

$$t_{1/2} = \frac{0.693}{0.0021} = 330 \text{ s}$$

Question: The percentage yield of the complete reaction is



Answer: 30.00

Solution: Percentage yield of complete reaction $= \frac{60}{100} \times \frac{50}{100} \times 100 = 30\%$

Question: Number of species having identical Bond order
CN , NO^+, O_2, O_2^+, O_2^{2+}
Answer: 3.00
Solution:
1) $O_2(16) = \sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ 2pz^2\ \pi 2px^2 = \pi 2py^2, \pi^* 2px^1 = \pi^* 2py^1$

Bond order $= \frac{10-6}{2} = 2$

2) $NO^-(14)$ = Bond order $= \frac{10-4}{2} = 3$

3) O_2^+ (15) = Bond order $= \frac{10-5}{2} = 2.5$

4) O_2^{2-} (14) = Bond order $= \frac{10-4}{2} = 3$

5) CN^- (14) = Bond order $= \frac{10-4}{2} = 3$

NO^-, CN , and O_2^{2+} has identical bond order

Question: How many of the following are not the ways to purify metal?
Distillation, Liquation, Electrolysis, Leaching, Calcination
Answer: 2.00
Solution: Leaching and calcination are not the method to purify metal.

Question: 20 ml of 0.02 M $K_2Cr_2O_7$ is titrated against 10 mL Fe^{2+} solution. The molarity of Fe^{2+} is ___ $\times 10^{-2}$.
Answer: 24.00
Solution: $Cr_2O_7^{2} + Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + Fe^{3+} + 7H_2O$
The redox changes involved are
i) $6e^- + Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$ (n = 6)
ii) $Fe^{2-} \rightarrow Fe^{3-} + e^{-+}$ (n = 1)
Milliequivalent of $Cr_2O_7^{2}$ = Milliequivalent of Fe^{2+}
$20 \times 0.02 \times 6 = 10 \times N$
$N = 0.24$

$$M = \frac{N}{\text{'n' factor}} = \frac{0.24}{1}$$

$= 0.24\ M$

$= 24 \times 10^{-2}\ M$